

1. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
- a piston slidably positioned in the cylinder separating the cavity
- into a compression chamber and an extension chamber;
- 5 a rod coupled to the piston and extending through one of the chambers and exiting the cavity;
- a tapered interface between the rod and the piston to thereby align the rod relative to the piston;
- 10 a passage through which the fluid moves between the extension chamber and the compression chamber during sliding of the piston in the cylinder; and
- 15 an air pressure actuated control valve assembly responsive to an air pressure input for adjustment to and between a plurality of positions to control the movement of fluid in the passage between the extension and compression chambers;
- wherein a damping force of the suspension damper is a function of the air pressure input;
- wherein the tapered interface provides a fluid tight seal.
2. The suspension damper of claim 1 wherein the tapered interface further comprises:
- a shoulder on a portion of the rod; and
- a confronting surface on a portion of the piston proximate the
- 5 shoulder.

3. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
- a piston slidably positioned in the cylinder separating the cavity
- into a compression chamber and an extension chamber;
- 5 a rod coupled to the piston and extending through one of the
- chambers and exiting the cavity;
- a resistance welded interface between the rod and the piston;
- 10 a passage through which the fluid moves between the extension
- chamber and the compression chamber during sliding of the piston in
- the cylinder; and
- an air pressure actuated control valve assembly responsive to an
- air pressure input for adjustment to and between a plurality of positions
- to control the movement of fluid in the passage between the extension
- and compression chambers;
- 15 wherein a damping force of the suspension damper is a function
- of the air pressure input;
- wherein the resistance welded interface provides a fluid tight seal.
4. The suspension damper of claim 3 wherein the resistance well
- interface is tapered.

5. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
  - a piston slidably positioned in the cylinder separating the cavity into a compression chamber and an extension chamber;
- 5           a rod coupled to the piston and extending through one of the chambers and exiting the cavity;
- a threaded interface between the rod and the piston;
  - a snap ring proximate the threaded interface to align the rod relative the piston;
- 10          a passage through which the fluid moves between the extension chamber and the compression chamber during sliding of the piston in the cylinder;
- an air pressure actuated control valve assembly responsive to an air pressure input for adjustment to and between a plurality of positions to control the movement of fluid in the passage between the extension and compression chambers;
- 15          wherein a damping force of the suspension damper is a function of the air pressure input; and
- a sealant at the threaded interface to provide a fluid tight seal between the rod and the piston.

6. A suspension system for a vehicle comprising:
- a pneumatic suspension sub-system selected from at least one of the following: a vehicle air-suspension system and a vehicle air-leveling system, the pneumatic suspension sub-system generating an air pressure value as a function of a weight of the vehicle and a condition of the road on which the vehicle travels;
- at least one damper comprising:
- (a) a cylinder defining a cavity being substantially filled with a fluid;
- (b) a piston slidably positioned in the cylinder separating the cavity into a compression chamber and an extension chamber;
- (c) a rod coupled to the piston and extending through one of the chambers and exiting the cavity;
- (d) an interface between the rod and the piston to thereby provide a fluid tight seal;
- (e) a passage through which the fluid moves between the extension chamber and the compression chamber during sliding of the piston in the cylinder; and
- (f) an air pressure actuated control valve assembly responsive to an air pressure input for adjustment to and between a plurality of positions to control the movement of fluid in the passage between the extension and compression chambers;
- wherein a damping force of the suspension damper is a function of the air pressure input.

7. The suspension system of claim 6 wherein the interface between the rod and the piston further comprises:

a tapered interface region between the rod and the piston to thereby align the rod relative to the piston and provide the fluid tight seal.

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8. The suspension system of claim 7 wherein the tapered interface region further comprises:

a shoulder on a portion of the rod; and  
a confronting surface on a portion of the piston proximate the shoulder.

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9. The suspension system of claim 6 wherein the interface between the rod and the piston further comprises:

a resistance weld between the rod and the piston.

10. The suspension system of claim 6 wherein the interface between the rod and the piston further comprises:

a threaded coupling between the rod and the piston;

a snap ring proximate the threaded coupling to align the rod

5 relative the piston; and

a sealant at the threaded coupling to provide the fluid tight seal between the rod and the piston.

11. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
- a piston assembly slidably positioned in the cylinder separating
- the cavity into a compression chamber and an extension chamber;
- 5 a rod coupled to the piston assembly and extending through one
- of the chambers and exiting the cavity;
- a passage through which the fluid moves between the extension
- chamber and the compression chamber during sliding of the piston
- assembly in the cylinder;
- 10 an air pressure actuated control valve assembly responsive to an
- air pressure input for adjustment to and between a plurality of positions
- to control the movement of fluid in the passage between the extension
- and compression chambers;
- wherein a damping force of the suspension damper is a function
- 15 of the air pressure input; and
- a uni-directional seal plate mounted in the piston assembly and in
- communication with the air pressure actuated control valve assembly;
- wherein the uni-directional seal plate is adapted for mounting in
- the piston assembly in a predetermined orientation.

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12. The damper of claim 11 wherein the uni-directional seal plate further comprises:

a step extending around a perimeter thereof.

13. The damper of claim 12 wherein the piston assembly further comprises:

a piston adapter having an annular lip crimped onto the step of the uni-directional seal plate.

14. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
- a piston assembly slidably positioned in the cylinder separating
- the cavity into a compression chamber and an extension chamber;
- 5 a rod coupled to the piston assembly and extending through one
- of the chambers and exiting the cavity;
- a passage through which the fluid moves between the extension
- chamber and the compression chamber during sliding of the piston
- assembly in the cylinder;
- 10 an air pressure actuated control valve assembly responsive to an
- air pressure input for adjustment to and between a plurality of positions
- to control the movement of fluid in the passage between the extension
- and compression chambers;
- wherein a damping force of the suspension damper is a function
- 15 of the air pressure;
- a piston adapter having an annular lip crimped onto a portion of
- the air pressure actuated control valve assembly.

15. A suspension damper comprising:
- a cylinder defining a cavity being substantially filled with a fluid;
- a piston assembly slidably positioned in the cylinder separating  
the cavity into a compression chamber and an extension chamber;
- 5 a rod coupled to the piston assembly and extending through one  
of the chambers and exiting the cavity;
- a passage through which the fluid moves between the extension  
chamber and the compression chamber during sliding of the piston  
assembly in the cylinder;
- 10 an air pressure actuated control valve assembly responsive to an  
air pressure input for adjustment to and between a plurality of positions  
to control the movement of fluid in the passage between the extension  
and compression chambers;
- wherein a damping force of the suspension damper is a function  
15 of the air pressure;
- a biasing member urging the air pressure actuated control valve  
assembly toward a closed position;
- a retainer coupled to the biasing member to thereby secure the  
retainer relative to the biasing member.

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16. The suspension damper of claim 15 wherein the biasing member is a spring.
17. The suspension damper of claim 15 wherein a portion of the suspension damper is deformed during assembly thereof to capture the retainer.

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